

Achieving Interaction in Distance Education: A Case Study

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Technological development and distance education

Fostering interaction has been one of the primary goals for distance educators in an effort to close the physical distance between teachers and students. This interaction has been attempted using both technological and instructional means. Although the two means function virtually in tandem, the attention paid to and the effort to improve them has not been equal. A glance at the history of distance education technology provides some insights into the issue.

Technological advance and distance education have gone hand-in-hand since the turn of the century. One trend in distance education technology has been improving the speed and amount of interaction possible between teacher and students. Before the invention of computers, the primary delivery means for distance education was print, a reliable medium but slow in facilitating feedback. As technological progress accelerated in the recent decades, electronic media became the dominant means for course delivery. Today many electronic technologies such as a microwave, satellite, cable TV, fiber optics, two-way audio, two-way video, Internet and World Wide Web are popular in distance education. However, the interaction between participants in distance education environment continues to be of concern.

Instructional Interaction

Since the origination of distance education as a viable means of education, interaction has been an issue. In a traditional face-to-face classroom, teaching and learning takes place with verbal and visual immediacies readily available. In a distance situation, however, students commonly do not have the same opportunity for interaction that they are accustomed to in the traditional classroom. Studies in the past have found that while distance students achieve as well or better than their on-campus counterparts, they often have a low level of satisfaction (Moore et al., 1990). One of frequent student complaints is the perceived need to see the instructor (Hayne and Dillon, 1992). Because of the feeling of isolation and neglect that was often

reported, distance education has been categorized as a tough learning situation (Thompson, 1989). In order to succeed in a distance education setting, students are somewhat autonomous and are expected to have a great deal of self-discipline.

If visual contact with the instructor is the key to the problem, then advanced technology should have provided a solution. Audio and video teleconferencing systems have become more affordable and carry voices and images across distances, providing a potential cure to the problem. Research has shown, however, that interactive technology does not guarantee live class interaction. Technology advancement has been reducing the drop-out rate of students enrolled in distance programs, but the level of participants satisfaction remains low (Garrison, 1989). Some research specifically comparing different modes of teaching finds that student satisfaction level is even lower in video-conferencing classes than that of audio-only (Dillon, et al., 1992). These results raise the question: What is important for successful interaction?

Mirroring the response of students, teachers often experience frustration in teaching at a distance, especially for the first few times. Researchers have observed the limitations for teachers trying to assess student response without the proper visual cues (Hsu, 1997). A potential danger is that teachers may speak rapidly and treat students anonymously during distance lessons. Not having direct eye contact, therefore, does pose the challenge to teachers of not letting technology interfere with instruction by finding ways to make use of the technology to achieve educational goals.

The trend of distance education research has been shifting from an intensive concentration on technology to the teaching-learning process that actually takes place at a distance (Gibson, 1991). The use of technology in the context of education is therefore, of vital importance.

Classroom Interaction

Moore (1990) describes three types of interaction in the learning process: student-content interaction, student-teacher interaction, and student-student interaction. Students learn the subject matter by interacting with material

from books, content experts, and/or other instructional materials providing student-content interactions.

The teacher plays an important role in validating student knowledge by engaging students in dialogue or conversation. Moore (1990) believes student-student interaction is often overlooked in regular face-to-face settings, but is an important facet of interaction that is potentially fostered or enhanced by distance education. This paper provides a closer examination of the role teachers and students may play in interacting at a distance.

The following case presents a qualitative study of distance class using an audiographic teleconferencing system. The case concentrates on how instructional interaction takes place in the technological context. It examines the use of technology in facilitating classroom interaction using the framework of the three types of interaction described above.

The Case

This distance class taught by the second author was entitled "Soil Fertility and Fertilizers". The teleconferencing system utilized two phone lines, one for audio and one for digital (visual). The digital instructional material was displayed on the computer screen at the sending site, and was also show on the screen simultaneously at all sites. There was no video component in the system, so the instructors and students did not have real time visual contact. Instructional material was displayed on the computer screen as the instructor lectured. The computer provided two-way interactive annotation tools as both instructors and students could use various tools such as electronic color pens for writing, drawing, and marking.

Twenty students in this class were participating simultaneously from four different locations. Two students were taking the course on campus and were in the same classroom with the instructor. The students ranged from 28 to 55 years of age and were predominantly male (approximately one female at each site). Many of them had years of practical field experience working on farms, in soil-testing labs, and privately owned agri-businesses. Some were teachers and soil-conservation educators with limited backgrounds in soil chemistry. About half of the class was taking this course as a part of a degree program. Participation was expected from each student.

During the lecture: Student-content interaction

The instructor prepared a complete and extensive collection of course materials; lecture notes, computer-generated graphics, color slides, videotapes, and laboratory exercises. Normally about 80% of the class time was devoted to the lecture. Lecture notes were digitized and laid out page

by page on the screen. A screen-identical handout was distributed to students at each class which contained more extensive information than that used in the same class taught face-to-face. While some other instructors do not give students extensive handouts for fear that the students will not pay attention to what they have to say, this class used a variety of methods to keep the students attentive and interactive.

Communicating with annotations. Writing on the screen was an essential part of the instructor's communication to students and technology made the task easier.

As a natural doodler the instructor said, "I like to make marks on the slides, and now the electronic pen never runs out of ink." The pencil-shaped mouse-pen also was easy to hold and to write with. During his lecture, as he narrated a concept, idea, or formula, his pen did not cease pointing, highlighting, marking, and writing on the screen. Besides following his lecture outline by listening, students could also tell by looking at the screen exactly where the lecturer was by following annotations of the color pen. These computer features provided the instructor flexibility that he did not have from his regular classroom overhead projector, allowing him to also physically annotate digitized slides showing important details. For example, he could circle in red the particular portion of a soybean leaf that illustrates iron deficiency. Observations from site visits affirmed that the instructor's annotation enhanced student attention.

Listening for a small comment. The instructor not only talked, but listened with concentration and keenness during his lecture. He picked up even little sounds from the students like a mumbling: "Excuse me! I can't hear you. Can you say it again?", he would say. When silence was returned, he asked a question. Sometimes the audio was less than ideal, and the sound coming from students was breaking-up over the lines, so he would say "Excuse me," or "Who is there speaking? Identify yourself, please." He did not let any chance for interaction slip away.

Asking questions. Instructors always want to encourage student participation in class, although it is never an easy job. While facing silence or no-response was not unusual, the instructor initiated interaction.

During the mid-semester interview, the instructor shared a number of tips he used to elicit student's responses: "When there is no response, he would ask: "Nobody cares?" to get their attention." In other instances, the instructor would give students some ridiculous answer which tends to get their attention. Their laughter following such remarks could be heard across the wire and helped relax a somewhat

stressful situation. If he thought some material was especially important, the instructor might add a comment: "I think this concept would make a good exam question, wouldn't it?"

Sharing with the students The instructor weaved into his lectures what he was thinking and feeling, as recorded in the following field note:

(7:15 PM) I thought it was quite impressive when the instructor drew a U.S. map on the screen and added some dots when explaining about the distribution of specific soil characteristics across the U.S. The lines were a little crooked, but the map looked fairly representative with about the right proportions. Ugly enough, but recognizable. He said nobody was giving him applause. Then there came some applause from the other end. He appeared to be very happy: "Thank you, thank you." He said: "You don't have to identify yourself if you are laughing at the map."

The instructor would also tell the students that he was drinking a coke, sitting in a small room, writing with twisted arms, and trying to chase the pen across the screen. One time, an evaluator was at the student site observing when the instructor said, "Oops. I'm off my screen now," everybody raised their heads and looked up. They then heard him say: "Come back pen!" This sort of sharing extends the instructor's personality through the distance.

During the Q&A: Student-teacher interaction

One stereotype of professors of science discipline is coming in the class to lecture and leaving when they are done with little emphasis on teacher-student interaction. The instructor in this case study saw value in having students actively involved. "I just do not feel comfortable when a student comes in, puts books down, gets the pen out, writes for fifty minutes, puts their pen away, and leaves. I like questions and interaction from students that tell me that they are thinking about what's going on; trying to relate what's in the book and what I have to say to their experiences. It's more exciting and interesting, for them and for me, if we can all be involved in the discussion." The instructor wanted to see some evidence there that they are grasping what is going on. The time for him to see this evidence was, he noted, "when the students ask questions."

Students' photos and class roster. Keeping a record of students' pictures had multiple meanings for the instructor. In his face-to-face classes, the instructor used a group picture of the students to learn their names. "It makes easier to ask questions if you know their names," the instructor added, "Also, if they spent the time and money to come here, the least I can do is to figure out who they are."

To try to keep a similar personal contact at

distances, the instructor displayed a copy of the class roster, which students each signed on screen with the electronic pen when they arrived in their classroom. The instructor used the roster to check attendance, and for asking questions.

The instructor taped the roster near the computer and marked on it when a student asked a question or makes a comment. By keeping track, he would know who had not yet responded, and who would be good candidates for the next questions. When students were missing, he would know not to call on them.

Students as experts. The instructor often referred to and utilized students' expertise. When posing a question, the instructor did not give the answer right away. He often referred the question to the members of the class. "Now, let's ask the field experts," or "Do we have a dolomite expert here?" Referring to students' expertise and experiences was both encouraging and engaging. If no one answered, he might say, "Good! Then I can say whatever I want."

Sometimes, reference to expertise was specific to individual students rather than to the group as a whole. "There is a more toxic element interfering with plant growth. Anybody want to offer a guess?" the instructor asked. This time he postponed his answer, waited for a while, and said: "Why don't we consult with a chemist? Joan?" Joan had called the instructor earlier to express her concern about her lack of chemistry background. The instructor encouraged Joan in front of the whole class because he knew that she would be able to answer the question. In this way, the instructor showed confidence in her.

On Campus Component. A small on campus component to distance education can be effective in enhancing student interaction. During the second half of the semester, the students from all the sites gathered together to have a one-day meeting on campus.

The main purpose of the meeting was for the students to use the laboratory equipment. Past experience indicated that students enjoy hands-on activity with lab equipment. They do not mind driving long hours to come to campus for one Saturday if it was scheduled early in the semester and they could see the "live" instructor and their classmates in person. The campus meeting extended the scope and level of interaction that is available at a distance.

Helping each other: Student-student interaction

Having classmates in a distance class with multiple locations can be different from having them in a regular class setting. Those who are at a distance may not necessarily see each other, talk to each other, learn about each others'

background and expertise, or hangout with each other after class. Many students nevertheless, actually developed appreciation toward students at other sites. If there is something that someone at one site doesn't pick up on, maybe someone at another site will.

Although most of the students at the same location started out the class not knowing each other, many of them got to know their peers better as the class progressed. During the site visit, for example, students were seen asking each other questions, joking with each other, and trying to help each other if there was a misunderstanding. Besides the instructor's effort, considerable student-student interaction occurred naturally. There are special reasons for students to become closer to each other in a distance class because the instructor is not physically present.

Dan, for example, explained that he liked the interaction with his neighboring students for "small questions," which can be of simple clarification and need not to be brought to the attention of the instructor. Dan suggested that, rather than raising his hand and bringing the whole class to a halt to get his question answered, you can just lean over and ask questions of the one next to him. They

can share what they wrote down in their notes and he moved on. "It really works pretty good and it doesn't disrupt the class. This distance setting enhanced these on-site, small-question communications between students. According to Dan, the technology allowed the class to have this interaction going on without being supervised. "Compared to a regular classroom, it meant more freedom." He commented: "In a regular classroom, if the instructor saw two students talking, he might object, and would probably want to know what they were talking about, bringing it up so the whole class could talk about it. While that sounds good, it would probably discourage some students from talking with each other at all. This distance setting facilitated not only students' exchange of ideas and questions, but also protected their anonymity from the instructor."

Student ratings for this course are one measure of success in teaching at a distance (Table 1). The results show that students ranked the physical facilities and services needed for the VTS format at 4.2/5.0 or higher. They were also ranked course materials except for the textbook at 4.2/5.0 or higher. The somewhat lower rating for the textbook was not unexpected and something the instructor has limited

Table 1. Student evaluations of Soil Fertility and Fertilizer taught via video teleconferencing (VTS).

Facility or Service	Rating (5.0 possible)
Site Logout	4.2
Visibility of VTS Display	4.5
Audio Quality	4.4
Technical Support Staff	4.4
Course Material	
Slides	4.4
Handouts	4.4
Videos	4.2
Text	3.8
Course Delivery and Interaction	
VTS for delivery	4.2
Instructor Feedback	4.1
Teacher-Student Interaction	3.9
Student-Student Interaction	3.8

control over. Finally, student ratings for VTS as a delivery method and instructor feed back were 4.2 and 4.1/5.0, respectively. Students ranked teacher- student and student-student interaction at 3.9 and 3.8 respectively. We believe these results indicate that using the techniques described in this paper, it is possible for adequate teacher-student and student-student interaction to take place at a distance even without a direct face-to-face connection.

Conclusion

Gaining and maintaining interaction at a distance is a complicated challenge. It requires both technological support and instructional deliberations. The case described showed that the students' experience can be positive even with a physical separation of the instructor and limited amount of communication channels (no image available) The success of this distance class is not meant as another "technology-is-good-for-learning" scenario. Rather, it reveals that the content presentation, teacher-student interaction, and students-student interaction require deliberation and effort. Facilitating interaction is a difficult challenge even in a face-to-face situation, but it can be more so when it is at a distance. Through the weave of teaching philosophies and the adaptation of technology, instructors can make satisfactory interaction possible. As more advanced technologies are employed and promise to change the ways we do teaching and learning, a careful examination of our existing practices may be more important than ever. It should help us to learn not what technology can do, but what we can do with technology to achieve our long-held educational goals.

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Curriculum Development: Starting with the Marketplace

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Abstract

Using a multiphase research approach, the Agribusiness Department at Cal Poly San Luis Obispo designed a new curriculum to serve agribusiness in a global environment. First the authors conducted secondary research to examine industry needs, existing programs, and agribusiness education theories. Then primary research was

conducted to identify the types of skills and courses needed by employees of California agribusinesses. The skills found most desirable are already addressed in the core curriculum of the agribusiness major; therefore, further research focused on developing the international concentration. In a joint discussion group, agribusiness executives and